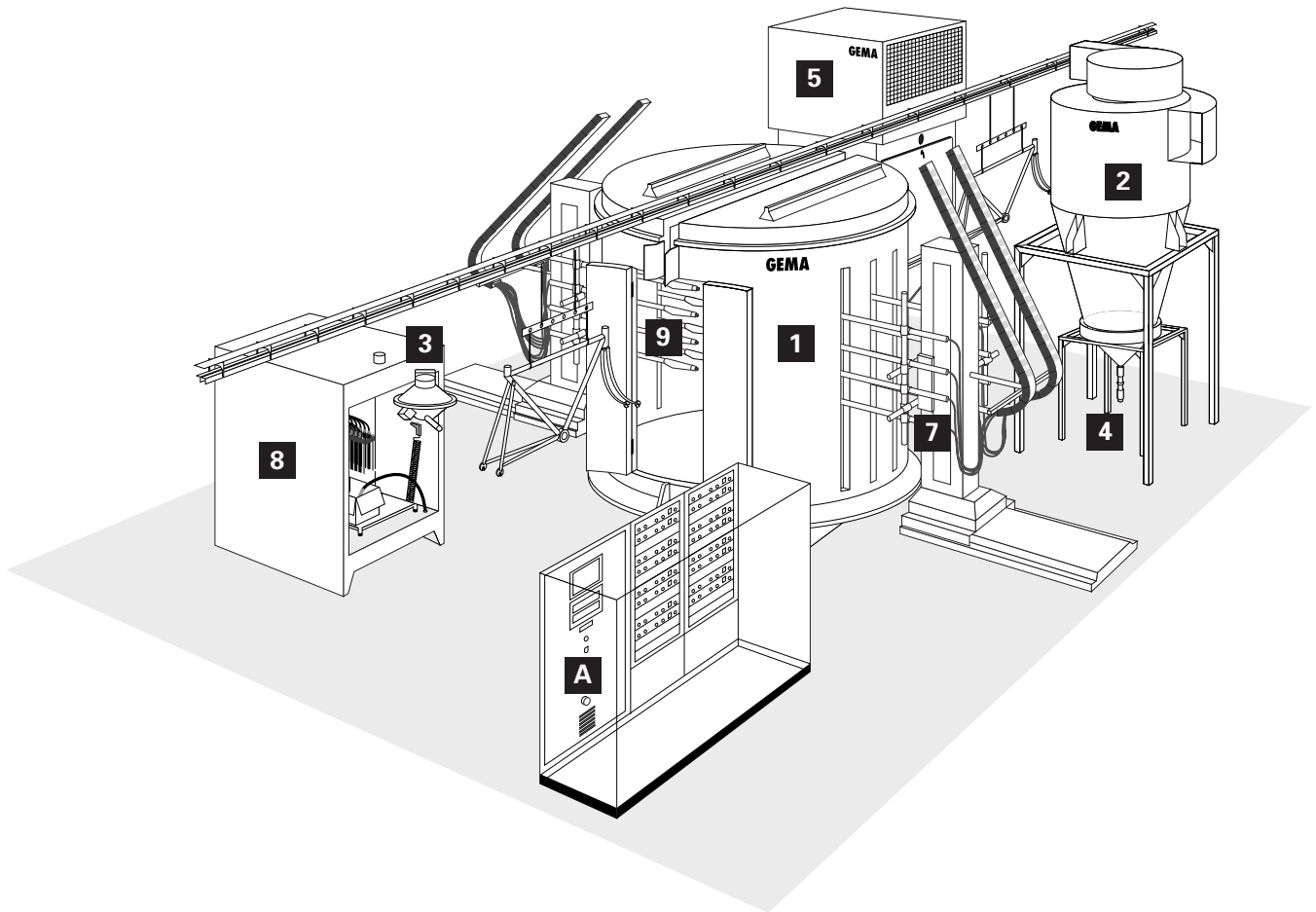


Operating Instructions

Magic Cylinder Powder Coating Booth



Magic Cylinder Powder Coating Booth



- | | |
|------------------------|--------------------------------------|
| 1 Booth | 7 Reciprocator |
| 2 Cyclone separator | 8 Powder Centre |
| 3 Sieve machine | 9 Vertical Automatic gun arrangement |
| 4 Dense Phase Conveyor | A Plant Control unit |
| 5 After Filter | |

Table of Contents

Safety Notice

Technical data

Important Information in Short

Description of Function	1
Field of function	1
Design and Function	2
Operating sequences	2
Powder flow	2
Booth	4
Booth superstructure	4
Booth base	4
After Filter Exhaust air system	4
Fire Safety	5
Cleaning operation	5
Powder recovery	6
Cyclone separator	6
Powder Sieve Machine on the Powder Centre	6
Dense Phase Conveyor	7
Function sequence	7
Powder Centre	9
Powder preparation unit	9
Powder transport equipment	9
Blow-out equipment	10
Function sequence during the Coating Operation	10
Without Fresh powder supply	10
With fresh powder supply	10
Function sequence during the Cleaning Operation	11
Automatic guns	12
Guns cleaning	12
Operation	13
Before switching the Booth on	13
Switching on the Booth	13
Switching the Booth off	13
Filter cleaning	14
Colour Change - Cleaning	15

Continued

Table of Contents (cont.)

Maintenance	17
Maintenance plan	17
Maintenance on the Cyclone separator	17
Maintenance on the Powder Sieve Machine	18
Maintenance on the After Filter Pressure Gauges (Filter and Fan) ...	18
Replacement of Spare Parts	18
General	18
Function check	19
Procedure for a Function Check	19
Troubleshooting Guide	20
Setting values	23
Connection diagram - Door Drive Unit	24
Pneumatic diagram - Flap Control Unit	25
Connection diagram - Flap Control Unit	26

Safety Notice

Installation

Installation work to be done by the customer must be carried out according to local safety regulations.

Grounding

Check the booth grounding before every start-up. The grounding connections are customer specific, and are fitted on the base the booth, on the Cyclone separator, and on the Filter housing. The grounding of the workpieces and other plant units must also be checked.

Operating the equipment

In order to be able to operate the equipment safely, it is necessary to be familiar with the Safety Notice, the workings, and functioning of the various plant units.

For this purpose, read the Safety Notice, these Operating Instructions, and the Operating Instructions for the Control unit with Control Panel before starting up the plant.

In addition, all further equipment-specific Operating Instructions e.g. the APS or OptiMatic Series, and all additional components should also be studied.

To obtain practice in operating the plant it is absolutely essential to start the operation according to the Operating Instructions.

Also later on they serve as a useful aid with possible faults or uncertainty, and will make many enquiries unnecessary.

For this reason the Operation Instructions must always be available at the equipment.

Should difficulties arise, however, your ITW Gema Service Centre is always ready to assist.

The contact address of your ITW Gema Service Centre is found on the inside title page of most Operating Instructions.

Inspection checks

The following points are to be checked at every booth start-up:

- No foreign material in the central suction unit of the booth
- The Powder Sieve Machine is connected on the Powder Centre and the clamp is tightly locked down
- Pneumatic hoses and powder hoses are connected on the Dense Phase Conveyor
- Pneumatic hoses connected to the After Filter, the filter cartridge door is closed, the waste container is fitted and locked in

Entering the Booth

Because of its design the booth it is not possible to enter the booth. Checks or cleaning are done through the booth openings without problem.



WARNING

Danger of slipping, and/or injury!

Repairs

Repairs inside the booth (coating area) must be carried out by trained personnel only.

Technical data

(Subject to change)

Electrical Connection:

Voltages: 3 x 380 V / 50 Hz
Other Voltages, and Frequencies on request.

After Filter Fan performance

22 kW with 18 Filter cartridges - 12000 m³/h
30 kW with 24 Filter cartridges - 16000 m³/h
2 x 22 kW with 36 Filter cartridges - 16000-20000 m³/h

After Filter with integrated noise damping filters

Fan differential pressure:

at 12000 m ³ /h	4.0 kPa
at 16000 m ³ /h	4.1 kPa
at 20000 m ³ /h	4.4 kPa

Compressed air connection:

Input pressure: min. 6 bar/max. 10 bar
Recommended input pressure: 7 bar
Oil/Water vapour content: max. 0.1 mg/kg
(oil / water)

Compressed air consumption

Rinsing air - Filter housing: max. 18 Nm³/h

Powder Sieve Machine (Powder Centre)

See separate Operating Manual.

Important Information in Short

Before switching the booth on

- Carry out a Start-up or a Function check
- Strictly observe the Safety Notice (see first side of previous page)

Switching on the Booth

1. Open the compressed air supply and set the input pressure for the After Filter to 5 bar
2. Switch on the Main switch - **Q0** (the Main switch is found on the Control cabinet)
3. Switch on the Key switch - **S0.1**:
The Control unit is released, the Control panel is activated, the Key switch returns to its original position
4. Activate the function "START SYSTEM":
The Main menu appears on the Control panel; the fan in the Powder Centre runs up
5. For operating the Powder Centre see separate Operating Manual
6. After the powder container is positioned on the Vibration table in the Powder Centre "COATING" can be initiated
The injectors travel downwards, the Level Sensor unit is active. Vibration and fluidization are switched on
7. Switch on the Powder Gun Control units
8. Activate the function "AUTOMATIC" on the Control panel
The Reciprocators travel to the Reference point, the fan in the After Filter runs up, and the cleaning cycle of the filter cartridges is activated.
All interlocked plant units are released (ES Control unit etc.)
9. Check the fluidization in the powder container. The powder must "boil" lightly, or reset on the pneumatic panel (Pressure gauge - FLUIDIZATION)

Switching off the Booth

1. Exit the function "AUTOMATIC OPERATION"
2. Switch off the Gun Control units and all additional plant units
3. Exit from the System Main menu
4. Switch the Powder Centre to "STANDBY"
5. Switch off the Main switch - **Q0**

Alarm

The Alarm horn sounds:

- See section Troubleshooting Guide, and corresponding "Control Panel" Operating Instructions

Maintenance

The maintenance plan on pages 17 and 18 must be read and followed.

Description of Function

Field of function

Magic Cylinder Coating booths are used for the electrostatic powder coating of all types of workpieces in large batches with frequent colour changes. They are laid out for fully automatic operation as part of the process controlled coating plant.

The important characteristics of Magic Cylinder Coating booths are:

- Vertical gun configuration
- Circular plastic construction
- Because of its compact size, and automatic coarse cleaning of the booth walls, no additional automatic cleaning equipment is required
- Central suction unit under the centre of the booth
- Powder Centre for using powder directly from a powder manufacturer's container
- Optional single colour recovery for single colour operation.

Design and Function

The principles of function are determined by the requirements placed on the booth, which are:

- the protection of the coating process from external influences, combined with keeping the area around the booth clean,
- the recovery of oversprayed powder and
- the avoidance of an explosive powder/air mixture inside the booth.

An efficient exhaust air system is used to keep the area around the booth clean and to prevent an explosive powder/air mixture. The air is extracted from inside the booth through a Cyclone and then through an After Filter. The air stream created thereby, flowing from the outside to the inside of the booth, prevents powder escaping to the outside of the booth, so that keeping the area around the booth clean is guaranteed. Even so, the maintenance of the air flow is not interrupted, so a dangerous powder/air mixture cannot escape into the workshop environment.

Powder recovery takes place through the separation of powder in the Cyclone separator during operation.

Commands are given through a Programmable Logical Control (PLC) with a Touch panel as interface.

All pneumatic controls are together in a cabinet, which in turn is controlled from the gun control unit.

The gun control units are fitted into one or two APS or OptiMatic cabinets. The switching on and off of the guns takes place through a gap detection unit in automatic mode.

⚠ IMPORTANT

More detailed information on the individual APS or OptiMatic components, and the PLC with Touch panel are found in the corresponding Operating Instructions!

Only the multiple colour version is described in the these Operating Instructions.

Operating sequences

When the booth is switched on the fan in the After Filter starts up and after it has run up to speed the units of the plant which are interlocked with the booth are released.

The operational condition is reached, as soon as all external plant, such as the Chain conveyor, Fresh powder container, Reciprocators, Fire protection, etc. are switched on.

All the operating functions on the control cabinet are now activated and can be released.

The coating process can begin. It is only interrupted when a fault in the fan motor is present. Other faults are indicated by an alarm or a message displayed on the control cabinet.

The suction in the filters is monitored during operation. The differential pressure and the measurement of the suction performance of the exhaust air system are also measured. A blockage of the filter cartridges is indicated through a drop in the suction performance (the differential pressure rises). On reaching a fixed preset value a signal lamp on the control cabinet illuminates, and at the same time, an alarm sounds.

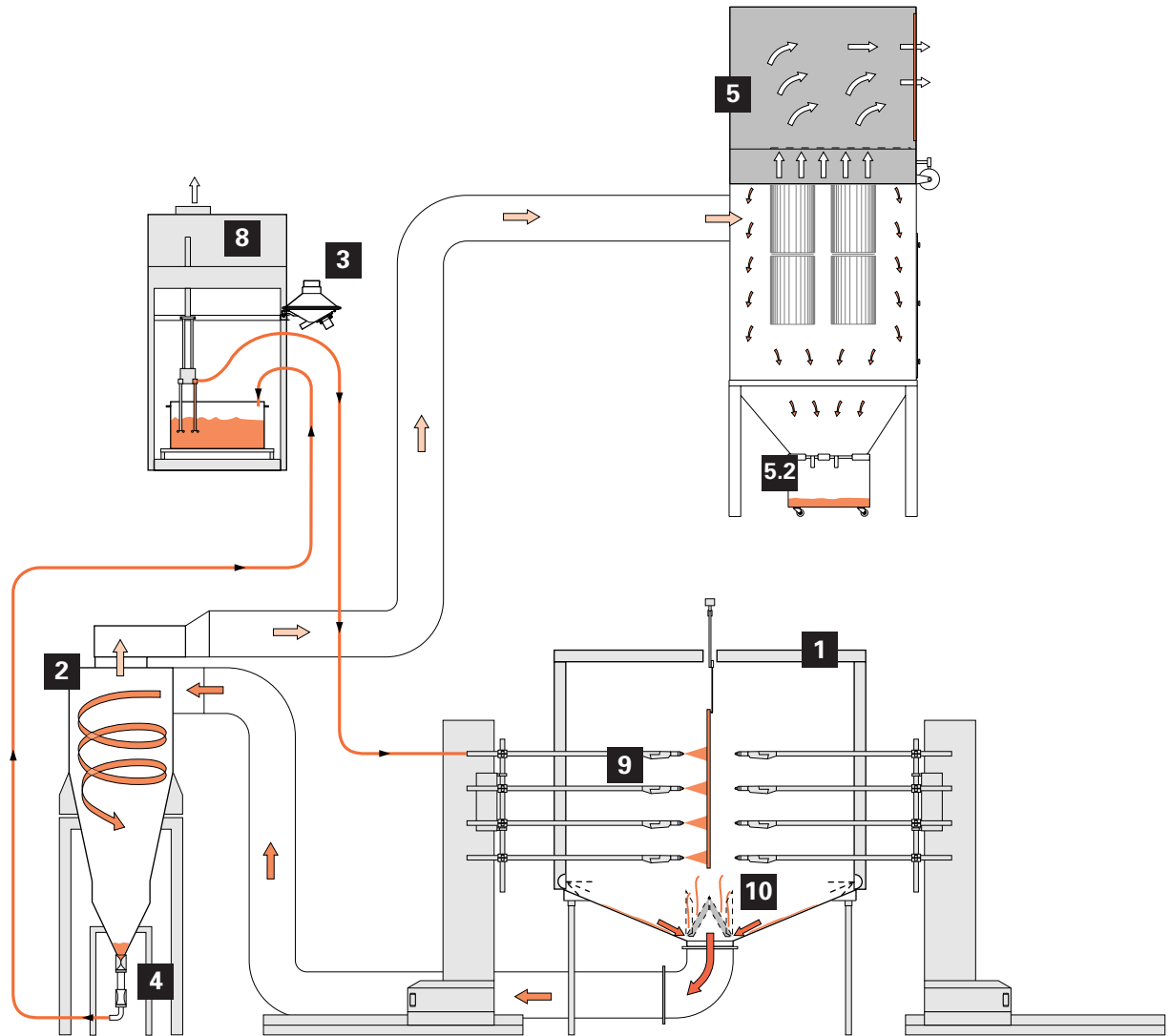
Powder flow

A powder manufacturer's container is in the Powder Centre (**8** - Fig. 1) where the powder is vibrated and fluidized. The injectors transport the powder through the hoses to the guns (**9** - Fig. 1). The guns spray a powder/air mixture onto the workpieces.

The powder which does not adhere to the workpieces falls to the booth floor and is sucked into the Cyclone separator (**2** - Fig. 1) as a powder/air mixture. In the Cyclone separator the powder is separated through the influence of centrifugal force. The separated powder is transported through a Dense Phase Conveyor (**4** - Fig. 1) to be cleaned in the Powder Sieve Machine (**3** - Fig. 1), mounted on the Powder Centre housing, and then back to the powder container in the Powder Centre (**8** - Fig. 1), where it stands ready for re-use in the coating process.

The remains from the separated powder (the fine particles) goes into the After Filter (**5** - Fig. 1). The After Filter separates the powder into a waste container (**5.2** - Fig. 1), which is positioned directly under the filter cartridges and is very easy to empty. The cleaned air then leaves the filter and is fed directly back into the workshop.

Powder Flow



- | | |
|------------------------|--|
| 1 Booth | 5.2 Waste container |
| 2 Cyclone separator | 8 Powder Centre |
| 3 Powder Sieve Machine | 9 Automatic guns |
| 4 Dense Phase conveyor | 10 Flap mechanism*
(normally closed during coating operation) |
| 5 After Filter | |

*** See "Booths using 16000 m³/h air volume or higher" page 4**

Figure 1

Booth (1 - Inside front cover)

Booth superstructure

The cylindrical booth superstructure is a double walled plastic panel construction, forming a side section, and a half roof on each side.

Horizontal spacing ribs guarantee high stability of the booth walls, and the necessary distance between the inner and outer liners for an optimum powder repelling effect.

In order to guarantee the powder repelling effect of the booth for a longer coating period, all grounded parts, including the booth superstructure supports, are positioned at the necessary required distance outside of the booth.

The interior of the booth is lit by two strip lights, which are fitted into the ceiling of the booth. Strip lighting is also available in the roof section above the manual coating station(s), if required.

Fold-back doors are fitted at the workpiece entrance and exit openings of the booth. These can be closed manually (standard) or automatically (optional) for cleaning.

The roof of the booth is extended over manual work stations to prevent stray air currents and powder escaping into the workshop environment.

The booth can be mounted at floor level or set into a pit, according to customer specifications, also depending on the requirements placed on the booth, pedestals, made of the same material as the booth, can be welded onto one or both ends at the workpiece entrance, and exit openings of the booth for manual coating stations etc. Metal grid pedestals can be placed around the booth as required by the customer.

Booth base

The booth base has a funnel-shaped floor, with a central suction unit*, made of reinforced plastic material.

Oversprayed powder depositing in the funnel is intermittently blown down into the central suction unit by jets of compressed air from air chambers running around the top of the sloping floor on each half of the booth.

After Filter (5 - Inside front page) Exhaust air system

Detailed Information about the After Filter is found in the separate After Filter Operating Instructions.

***Booths using 16000 m³/h air volume or higher**

Booths requiring an air volume of 16'000 m³/h or higher, should have the flap unit fitted along the central axis of the booth (the same axis as the chain conveyor) above a trough-shaped central suction channel in the base of the booth.

The floor of this booth type is flat, and slopes into a trough under the flap mechanism in each booth half.

When required these flaps are operated manually to clear excess powder deposits into the central suction channel during a pause in coating, and also during booth cleaning or at colour changes.

Fire Safety

It is recommended that the plant be fitted with CO² Extinguisher equipment, which complies with local safety regulations.

Cleaning operation

During the automatic gun, and booth cleaning the workpiece entrance, and exit doors are closed. Because of this the air entry speed is increased at the remaining openings. This ensures a dust-free area around the booth during the cleaning procedure.

Powder recovery

The powder recovery system comprises a Cyclone separator, a Dense Phase Conveyor, and a Powder Sieve Machine.

The overspray powder is fed from the central suction opening in the sloping floor through a duct to the Cyclone. The powder is separated in the Cyclone. The powder is fed from the Dense Phase Conveyor and then sifted by the Powder Sieve Machine mounted on the Powder Centre and from there back to the powder hopper.

Cyclone separator (2 - Inside front page)

The powder recovery system was specially developed for the Cyclone separator and distinguishes itself by its easy to clean cylindrical separation chamber, and its high efficiency.

For the separation process the powder-carrying exhaust air is fed tangentially into the Cyclone and set in rotation. The rotation flow runs spiral-shaped, downwards, where it is decelerated near the Dense Phase Conveyor and rises as a second spiral upwards, to exit the Cyclone through the suction tube.

The rotary flow causes a centrifugal separation of particles, which move along the interior wall of the Cyclone in "strands" down to the Dense Phase Conveyor. A large part of the powder is directly separated from the air on entry into the Cyclone. The centrifugal force is not sufficient to separate the very smallest particles from the air.

For maintenance and cleaning of the Cyclone at colour changes the lower funnel can be detached by means of pneumatic cylinders and then moved away from the Cyclone.

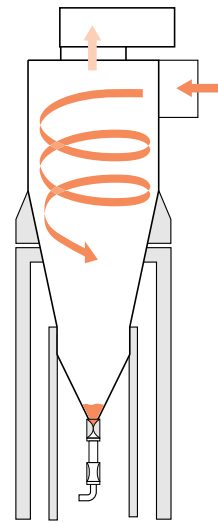


Figure 2

Powder Sieve Machine on the Powder Centre (see 8.6 - Fig. 4)

For operating the Powder Sieve Machine integrated in the Powder Centre, see the separate Operating Instructions supplied.

Dense Phase Conveyor (4 - Inside front page)

The separated powder is transported by the Dense Phase Conveyor to the Powder Sieve Machine on the Powder Centre.

This powder transport principle permits very careful and dust-free powder transport, because the air requirements necessary and the transport speed are very low.

Function sequence

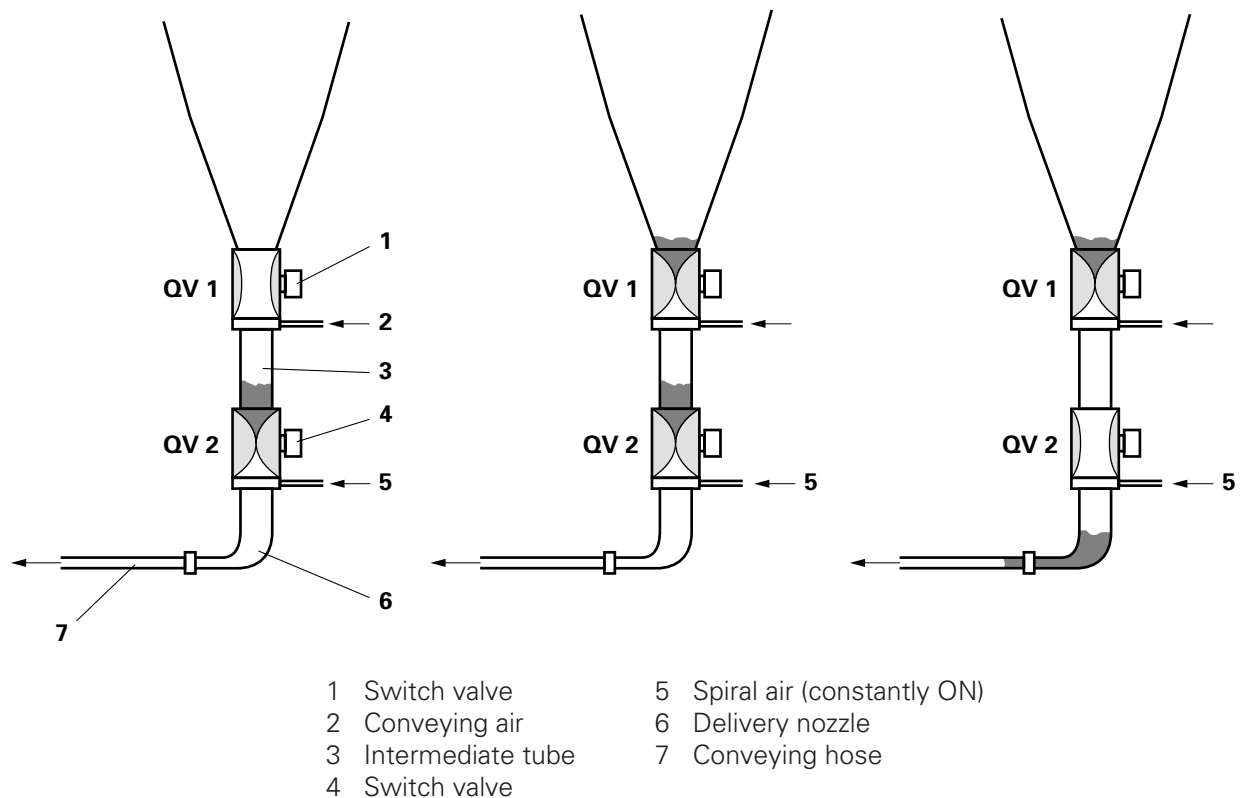


Figure 3

- 1) The upper Pinch valve - QV1 opens.
 The recovered powder falls through Pinch valve - QV1 into the Intermediate tube (3).
 - The lower Pinch valve - QV2 is thereby closed.
 - The Spiral air (5) is constantly in operation.
 - The Conveying air (2) is switched off.
- 2) Pinch valve - QV1 closes.
- 3) Pinch valve - QV2 opens.
 - The Pinch valve - QV1 is thereby closed
 - The Spiral air (5) is constantly in operation.
 - The Conveying air (2) is switched on for a short time.

(continued)

Dense Phase Conveyor - Function sequence (continued)

Due to the over-pressure in the Intermediate tube (**3** - Fig. 3, page 7) the powder is pressed through the Pinch valve - QV2 into the Delivery nozzle (**6** - Fig. 3, page 7).

Switching on the Conveying air (**2** - Fig. 3, page 7) for a short time transports the powder in the Conveying hose (**7** - Fig. 3, page 7) a step further.

- 4) Pinch valve - QV2 closes.
 - After a short delay Pinch valve - QV1 opens again.
 - Steps 1) to 4) are repeated continuously.

After a short time the Conveying hose (**7**) fills with a number of individual powder "packets", which are continuously transported to the powder container.

The transport efficiency is dependent on the type of powder, pulse rate, and length of the Conveying hose (**7**) and the dimensions of the actual Pinch valve, and Conveying hose (**7**) used.

Powder Centre (8 - Inside front cover)

The Powder Centre is designed for the quick colour change concept and replaces the usual powder coating from fluidized powder containers.

Instead of a fluidized powder container a Powder box or Powder manufacturer's container is supplied for direct use. After use this can be returned to the powder store.

The Powder Centre is an independently functioning unit with its own **Powder preparation unit**, **Powder transport equipment (8.2)** and **Blow-out equipment (8.3)**, **Exhaust air system (8.4)**, a **vibration Powder Sieve Machine (8.6)** an **Electrical Control unit (8.5)** and **Pneumatic Control unit**.

In order to avoid colour change problems, well-known from practical experience, a fundamental difference is made in the Powder Centre between light and dark colours to achieve a quick and qualitatively good change-over from light to dark colours or vice versa.

This means, that each has its own **set of powder hoses** for light, and dark colours.

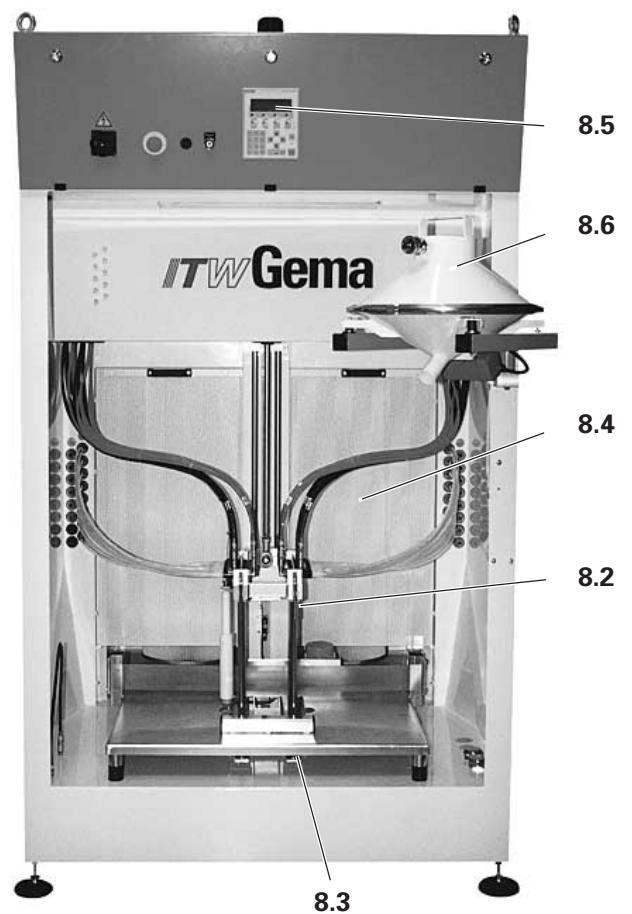


Figure 4

Powder preparation unit

Recovered powder and also the fresh powder is loosened up in the powder preparation unit for transport to the Spray guns.

The Powder box or the Powder manufacturer's container, from which the guns are supplied, is positioned on the Vibration table. Additional local fluidization is required, so that the powder can be transported.

Powder transport equipment (8.2)

The injectors with suction tubes, powder hoses, and powder level regulation (with fluidization) are included in this collective term.

The complete powder transport equipment is fitted on a pneumatic Linear cylinder.

Blow-out equipment (8.3 - Fig. 4 and Fig. 5)

The Blow-out equipment serves to automatically clean or blow out the injector suction tubes, injectors, powder hoses, and spray guns.

The Blow-out nozzles required for this are fitted below the Vibration table. One Blow-out nozzle is fitted for each injector.

The cleaning sequence must be initiated manually by activating the function "CLEANING" at the corresponding control panel. From here on cleaning takes place automatically.

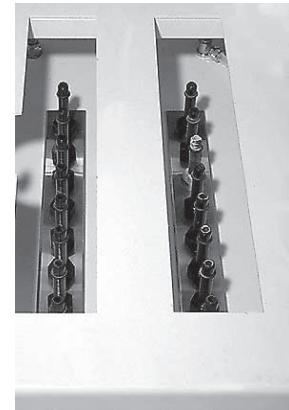


Figure 5

Function sequence during the Coating Operation

Basically, two types of operation are possible with the Powder transport equipment.

Without Fresh powder supply

Normally, multiple colour operation is done without a automatic fresh powder supply. With this main function the powder transport equipment moves constantly downwards with the sinking powder level in the Powder box (or the Powder manufacturer's container). The level of the powder to be fluidized is set by the Level Sensor.

When the powder transport equipment reaches the lowest powder level a signal is given. The empty powder container must be replaced with a full one or refilled. The coating process can now be restarted.

With fresh powder supply

If coating is done with an automatic fresh powder supply, e.g. one main colour, with fresh powder supplied from a Big Bag, then the powder transport equipment travels to its lowest set level and remains there.

In this case the fresh powder supply is initiated through the Level Sensor.

As soon as the Level Sensor is no longer covered with powder, the fresh powder supply is initiated.

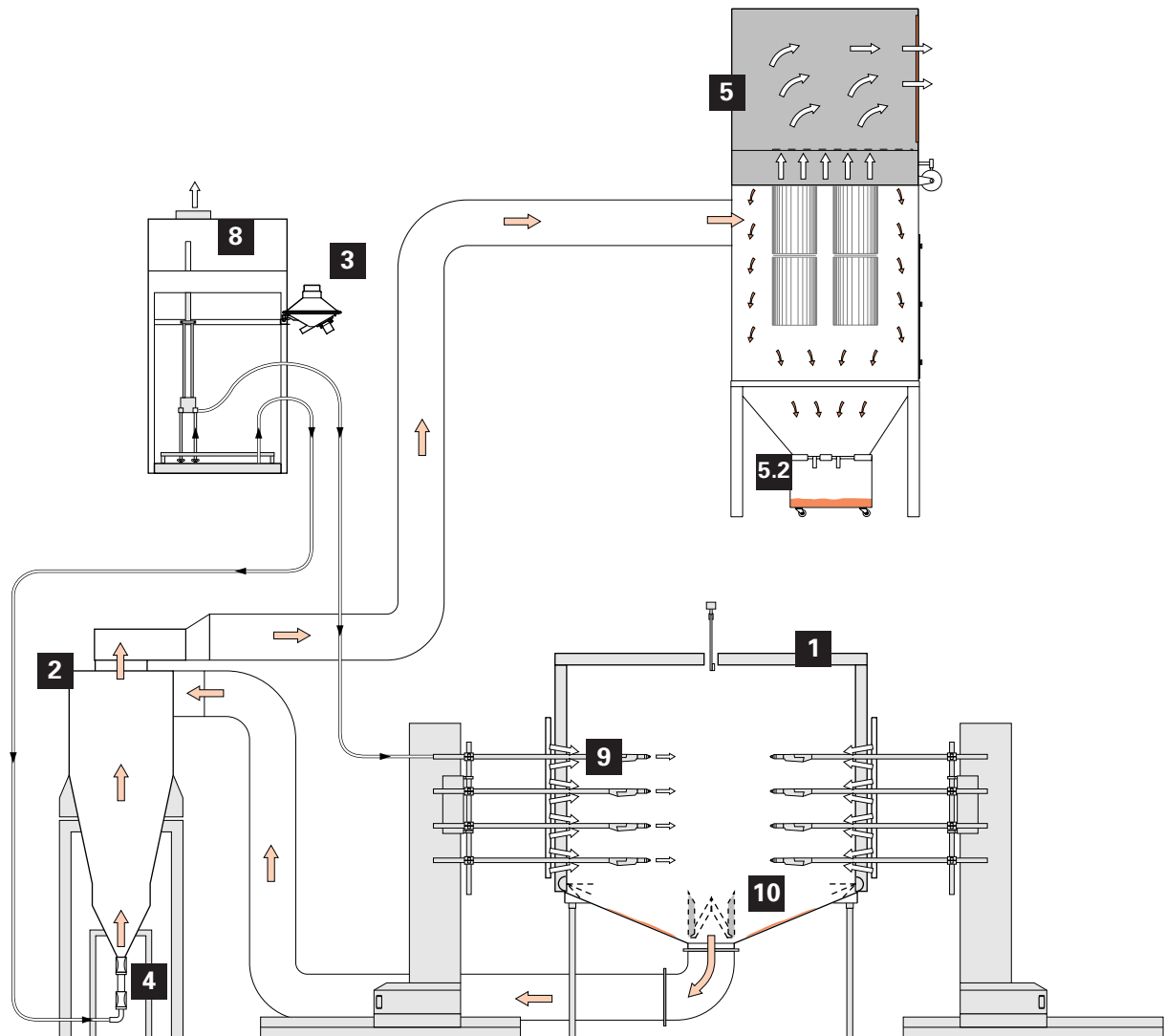
To ensure a continuous powder output to the guns the powder level in the powder hopper must be held constant.

Function sequence during the Cleaning Operation

During cleaning the Powder box (or the Powder manufacturer's container) is to be removed from the Powder Centre.

Activating the function "CLEANING" in the Powder Centre moves the powder transport equipment down into the cleaning position. The injector suction tubes, injectors, powder hoses, and guns are rinsed through in pulses.

During the cleaning sequence the powder transport equipment must be cleaned externally with a compressed air gun.



- | | |
|-------------------------------|--|
| 1 Booth | 5.2 Waste container |
| 2 Cyclone separator | 8 Powder Centre |
| 3 Powder Sieve Machine | 9 Automatic guns |
| 4 Dense Phase Conveyor | 10 Flap mechanism*
(normally open during cleaning operation) |
| 5 After Filter | |

***See "Booths using 16000 m³/h air volume or higher" page 4**

Figure 6

Automatic guns (9 - Inside front cover)

PG 2-AX Automatic Powder Guns are used in the Magic Cylinder Powder Coating booth, and were specially developed for simple automatic cleaning.

The connections for powder hoses, electrical current, and electrode rinsing air are all outside of the coating booth.

These supply channels are integrated into the PG 2-AX guns, therefore the guns can be cleaned automatically with blow-off nozzles.

The powder hose connections make perfect fixing of the powder hose possible through the clamping device, which is above all, a prerequisite for automatic rinsing of the powder transport equipment. (For more information about these guns, see PG 2-AX Operating Instructions)

In principle, the Magic Cylinder makes a distinction between light and dark colours. As a result of this, all the powder hoses from the Powder Centre are duplicated.

Guns cleaning

The PG 2-AX guns are cleaned very simply and quickly.

Activating the function "CLEAN GUNS OUTSIDE" on the corresponding control Panel or Touch Panel moves the Reciprocators, respectively, the guns out of the booth. Simultaneously, each gun is blown off cleanly on the outside of the booth by four flat jet blow-off nozzles.

These flat jet blow-off nozzles are found on the outside of the gun slots of the booth.

If necessary, this cleaning sequence can be repeated.



Figure 7

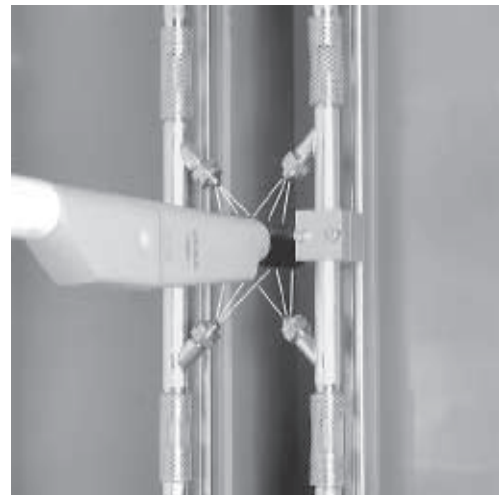


Figure 8

Operation

Before switching the Booth on

- Read the Safety Notice (see the front pages of these Operating Instructions)
- Check the grounding of the booth and the other plant units. Ground, where necessary
- Carry out a function check before starting work (see page 19)
- After a long standstill :
 1. Fill with powder or
 2. If necessary, top up with powder
 3. Check the seating of the filter cartridges
 4. Place the waste container under the After Filter

Switching on the Booth

1. Open the compressed air valve and set the input pressure for the After Filter to 5 bar
2. Switch on the Main switch - **Q0** (the Main switch is on the Control cabinet)
3. Switch on the Key switch - **S0.1**:
The Control unit is active, the Control Panel is activated, the Key switch returns to its starting position
4. Activate the function "START SYSTEM":
The Main menu appears on the Control panel; the fan in the Powder Centre runs up
5. For operating the Powder Centre see separate Operating Manual

Switching the Booth off

1. Exit the function "AUTOMATIC OPERATION"
2. Switch off the Gun Control units and all additional plant units
3. Exit from the System Main menu
4. Switch the Powder Centre to "STANDBY"
5. Switch off the Main switch - **Q0**

Filter cleaning

The filter elements are blown off from the inside of the filters to the outside, in cycles during operation. The predetermined cycle times are set at the factory, but must be reset, however, when the maximum differential pressure is repeatedly exceeded (this initiates an Alarm).

The differential pressure is displayed on the pressure monitoring (Pressure gauge - Pneumatic panel):

"Pressure monitoring on the Filter" is only displayed optically on the pressure gauge

"Pressure monitoring on the Fan" is displayed optically and the Alarm is initiated through 2 Manostats, optically and acoustically).

The upper limiting value, through which the Alarm is initiated, is plant-specific and is set by our trained Service personnel when assembling the booth.

The setting of the cycle times must also only be undertaken by trained Service personnel. The input is done directly on the Control Panel (see also "Control Panel" Operating Instructions).

Colour Change - Cleaning

Following is a step by step description of the procedure by which a colour change from "Light" to "Dark" (or vice versa) is done. A prerequisite for a quick and efficient colour change is that it is done by 2 people, so that some of these steps can be carried out simultaneously. A colour change can begin when the last workpieces have left the booth. Coating is stopped automatically in Automatic operation.

1. Close all the booth doors
2. Exit the function "AUTOMATIC OPERATION" on the Control panel
The injectors travel upwards out of the powder container automatically
3. Activate the function "CLEANING"
The Chain conveyor stops automatically. The Reciprocators travel to the Reference point.
4. Disconnect the Recovery hose in the Powder Centre and, if the powder recovered by cleaning is to be re-used, place the hose in an empty bag or otherwise, lay it on the floor of the Powder Centre.
 - 4.1 Remove the powder container
 - 4.2 Blow off the exterior of the injectors and suction tubes
The excess powder is sucked up by the Powder Centre.
5. Activate the function "CLEAN GUNS OUTSIDE"
The guns travel automatically all the way to the interior and then all the way out of the booth and are thereby blown off
6. The function "TRAVEL REVERSE" is carried out automatically together with Step 5.
The guns travel approximately 30 cm to the interior.
7. Activate the function "START CLEANING INJECTORS"
The injectors travel downwards automatically, and are rinsed in approximately 100 second pulses and remain stopped in the lower position.
8. Blow off the injectors and suction tubes externally again
The excess powder is sucked up by the Powder Centre.
9. Activate the function "START CLEANING INJECTORS" again when previously working with the same colour for more than 1 shift.
Injectors are rinsed again in pulses (100 secs) and remain in the lower position.

Only if necessary:

- 9.1 Remove the powder hoses from the injectors and clean with foam rubber cubes (Blow through the hoses).
- 9.2 Release the hose connections and clean the injectors with compressed air, if necessary, blow through.
- 9.3 Assemble the injectors and fit the powder hoses.
- 9.5 Activate the function "HOSE CLEANING" again.
- 9.7 Clean the nozzles used in the Powder Centre and prepare for the next colour change.
- 9.8 Fit the clean powder hoses onto the guns

(continued)

Colour Change - Cleaning (continued)

10. Clean the booth interior on both sides with the air lance from the top, down to the bottom.
11. Remove the nozzles of the guns and lay them to the side.
 - 11.1 Blow off the gun nozzles with a compressed air gun.
 - 11.2 Assemble the clean nozzles.



NOTICE

Tighten the threaded sleeve well!

12. Release the clamping cylinders on the Cyclone separator. Roll the Funnel away from the upper part the Cyclone Separator.
13. Activate the function "LIFT CYLINDER"
Recovery is switched off
 - 13.1 Remove the bag with the recovered powder after booth cleaning and connect the Dense Phase Conveyor hose in the Powder Centre to the Blow-out connection.
The powder can be used again the next time.
 - 13.1 Activate the function "BLOW OUT DENSE PHASE CONVEYOR"
The hose is blown out in pulses.
14. After approximately 20 seconds activate the function "BLOW OUT DENSE PHASE CONVEYOR" again
The sequence is terminated.
15. Roll the Funnel carefully away and clean with the compressed air gun.
16. Blow off the inside of the Cyclone with the air lance from the bottom to the top.
17. Connect the Funnel to the Cyclone.
18. Change the Dense Phase Conveyor hose if changing from "light" to "dark" or vis versa.
19. Activate the function "AUTOMATIC"
20. Place the powder container with the desired colour onto the Vibration table.
21. Activate the function "CYLINDER DOWN"
The injectors travel downwards. The powder penetration depth is dependant on the setting of the Level Sensor.
22. Place the end of the Dense Phase Conveyor hose in a bag for the first 4 minutes of production and then into an empty bag.

For pauses in working such as night-time, holidays, etc.:

- Carry out Steps 1 – 7
- Check nozzles for wear
- Check the injector hose connections for wear or blockage with the aid of an ITW Gema Plug gauge (Order No. **362 280**).

Maintenance

Maintenance plan

Interval	Action to be taken
Daily or after every shift	Blow the powder hoses through Clean guns externally and check parts for wear Check the Powder Sieve Machine on the Powder Centre and clear away contamination with an industrial vacuum cleaner
Weekly (in single shift working or every 5th shift in multiple shifts etc.)	Empty the waste powder containers of the Powder Centre, and the After Filter. Clean the booth completely Check all oil separators and empty (if oil and/or water are present, the compressed air unit must be checked)
Every 6 months	Check the Clean air chamber in the After Filter housing through the inspection window of the filter housing above the door for powder deposits; if powder deposits are present, this is an indication of defect filter cartridge(s). Replace the filter cartridge(s) - see "After Filter" Operating Instructions.



The parts to be replaced during maintenance are available as Spare Parts. These parts can be found in the relevant Spare Parts List.

Maintenance on the Cyclone separator

The following work on the Cyclone should be carried out regularly:

- Remove powder deposits and caked powder.
- Check seals, sealing strips, and closing mechanisms for functioning, and sealing.
- Replace the material abraded from the Cyclone inside walls by abrasive powders (by build-up welding).

Maintenance on the Powder Sieve Machine

The following work on the Powder Sieve Machine should be carried out regularly:

- Check the seals and if necessary, replace.
- Check the clamping force of the clamping lever and if necessary, reset.
- Clean the Powder Sieve Machine mesh or when damaged, replace the sieve insert.

Maintenance on the After Filter Pressure Gauges (Filter and Fan)

The following check should be carried out regularly:

- Make a note of the pressure on the gauges and make a comparison with the original pressure values which were set by the ITW Gema Service engineer at the first Start-up.
- See also "Troubleshooting Guide", pages 20-21 (entries dealing with "Filter" and "Fan pressure") and the "Troubleshooting Guide" of the After Filter Operating Instructions.
- If it is not possible to achieve the original settings, please contact an ITW Gema Service Centre.

Replacement of Spare Parts

General

Spare parts are to be replaced by trained personnel only.

The plant power must always be switched off when replacing Spare Parts.

Only Original ITW Gema Spare Parts are to be used!

Spare parts can be ordered from the Spare Parts Lists.

Function check

Function checks are to be carried out:

- After replacement of spare parts or electrical parts on the booth or equipment connected with the booth.
- After work on electrical parts, on equipment connected externally to the booth Control unit or on the booth Control unit itself
- After a long standstill

Procedure for a Function Check

1. Switch on the Main switch - **Q0** (the Main switch is on the Control cabinet)
The APS or OptiMatic Control units and all interlocked equipment should not be able to be switched on
2. Switch on the Key switch - **S0.1**:
The Control unit is active, the Control panel is activated, the Key switch returns to its starting position. The APS or OptiMatic Control units and all interlocked equipment should not be able to be switched on
3. Activate the function "START SYSTEM":
The Main menu appears on the Control panel; the fan in the Powder Centre runs up
4. For operating the Powder Centre, see separate Operating Manual
5. After the powder container is positioned on the Vibration table in the Powder Centre the function "COATING" can be initiated
The injectors travel downwards, the Level Sensor unit is active. Vibration and fluidization are switched on
6. Switch on the Powder Gun Control units
7. Activate the function "AUTOMATIC" on the Control panel
The Reciprocators travel to the Reference point.
All interlocked plant units are released (ES Control unit etc.)
 - the APS or OptiMatic Control unit and all interlocked equipment are ready for operation
 - after a delay the message "Too little powder" appears on the Touch Panel and the Alarm horn sounds

Troubleshooting Guide

CAUTION

Faults are to be corrected by trained Personnel only!

Faults, which appear during operation (together with an Emergency stop) are registered in a list with date and time references and are displayed as an Error message in the "Messages" Mask on the Touch Panel. When a fault appears the plant is not stopped. However, when an Emergency Stop appears the whole plant (or units) are switched off and displayed in the Emergency Stop Mask on the Touch Panel. The Alarm horn sounds simultaneously with every message (Fault or Emergency stop).

Fault/Error/Problem	Precaution/Solution
Alarm has sounded Message "Too little powder LIGHT (DARK)"	<p>Light blinks in the Powder Centre. Press ACK. Refill with fresh powder.</p> <p>Powder shortage in the Powder container Switch off the Alarm with "HORN OFF", fill with fresh powder</p>
Alarm has sounded, Message "EMERGENCY STOP Protective switch"	<p>Motor fault - Exhaust air fan, corresponding Motor protection switch has reacted Let the motor cool down, switch on the corresponding Motor protection switch again (see Wiring diagram). See also the section "Troubleshooting" in the After Filter Operating Instructions. With repeated Alarms, contact your ITW Gema Service Centre</p>
A rise in pressure is indicated on the "Filter" Pressure gauge	<p>Pressure rise in the filter cartridges Switch off the Gun Control unit, wait until the differential pressure returns to normal again. Check the cleaning cycles, by ear. If necessary, shorten the pause times in the cleaning cycle. Check, if the cleaning pressure is set at 5 bar at the Pressure input valve. See also the section "Troubleshooting" in the After Filter Operating Instructions.</p>
CAUTION	<p>If the pressure gauge shows a rise in pressure greater than 3 kPa, contact your ITW Gema Service Centre right away.</p>

Fault/Error/Problem
Precaution/Solution

Alarm has sounded,
 Message "Fan Over-pressure"

Minimum pressure not reached in the Filter housing - corresponding pressure gauge responding

Too little pressure, too much exhaust air, because too little or no air resistance

- Filter housing door open
- Lower Funnel not fitted tightly on the Cyclone separator
- Waste container not fitted tightly

See also the section "Troubleshooting" in the After Filter Operating Instructions.

Alarm has sounded,
 Message "Fan low pressure "

Maximum pressure in the Filter housing exceeded - corresponding pressure gauge responding

Pressure too high, too little exhaust air because the air resistance is too high:

- Filter clogged (Valve defect or cleaning pressure too low - at least 5 bar)
- Poor quality compressed air (contains oil and/or water)
- Fault on running-in, until the filter cake has built up on the filter cartridges.

See also the section "Troubleshooting" in the After Filter Operating Instructions.

Alarm has sounded,
 Message "Gun not OK"

Diagnostic adapter of the guns indicates that no High-Voltage is being produced

Switch on the Gun Control unit or correct the fault in the Gun Control unit or guns from the information in the corresponding Operating Instructions.

(continued)

Fault/Error/Problem**Precaution/Solution**

Bad separation efficiency of the Cyclone

- Check all seals, above all, on the powder separation of the Cyclone, if necessary, replace
- Check the Exhaust air volume flow, if necessary, clear blocked hoses or overhaul the After Filter.
 - Check the Cyclone casing for holes caused by wear or for depositing, and sintering of powder.
 - Check the clamping force on the Funnel seal
-

Powder Sieve clogged

- Check the powder for dampness
 - Check if too much powder is fed through the Cyclone, e.g. by booth cleaning.
 - Check if the Vibration motor is switched on
 - Check if the vibration is strong enough, if necessary, reset the oscillating weight of the Vibration motor.
-

Setting values



IMPORTANT

Setting values are found in the corresponding sections in the corresponding "Control Panel" and "Powder Centre" Operating Instructions!

Connection diagram - Door Drive Unit

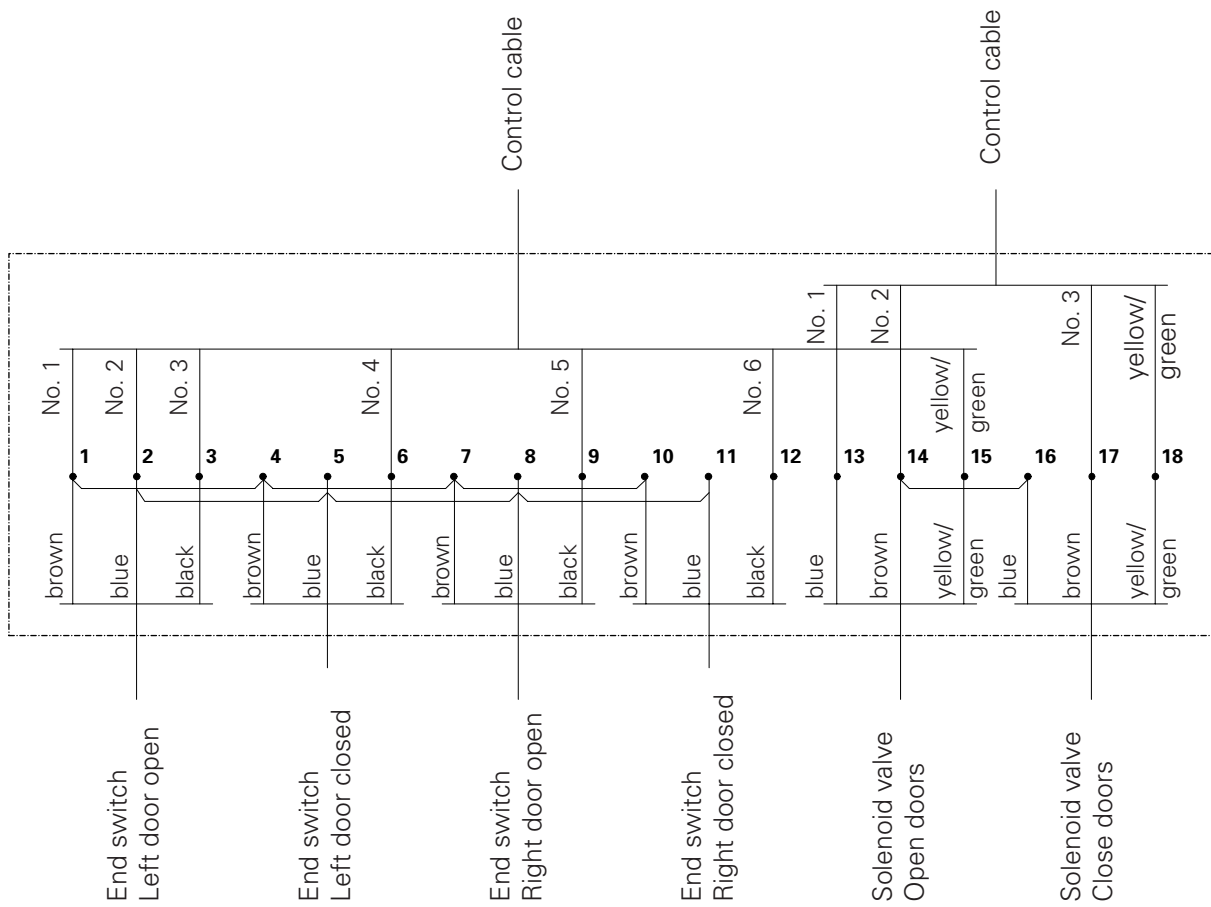


Figure 9

Pneumatic diagram - Flap Control Unit

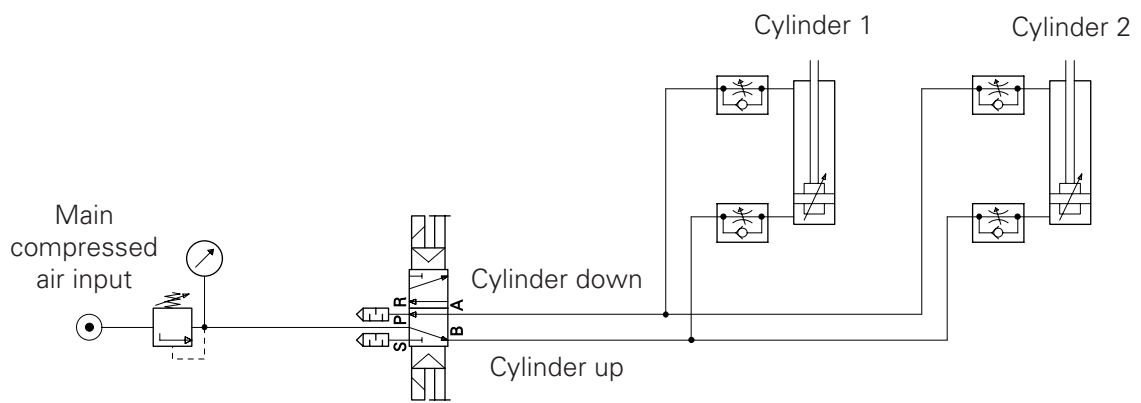


Figure 10

Connection diagram - Flap Control Unit

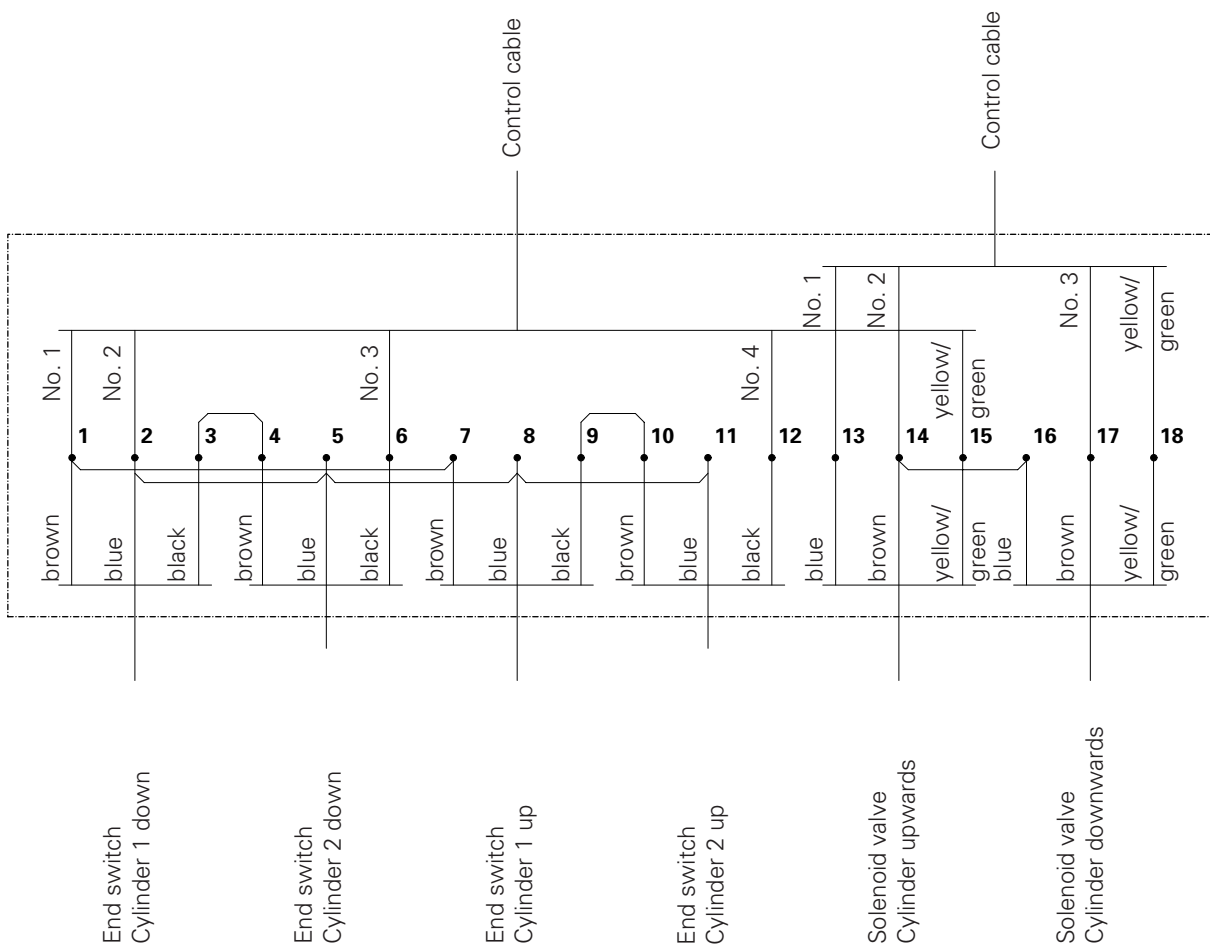


Figure 11

NOTES:

Documentation Magic Cylinder

© Copyright 1997 ITW Gema AG.
All rights reserved.

This publication is protected by copyright. Unauthorized copying is prohibited by law. No part of this publication may be reproduced, photocopied, translated, stored on a retrieval system or transmitted in any form or by any means for any purpose, neither as a whole nor partially, without the express written consent of ITW Gema AG.

OptiTronic, OptiGun, EasyTronic, EasySelect, EasyFlow and SuperCorona are registered trademarks of ITW Gema AG.

OptiMatic, OptiMove, OptiMaster, OptiPlus, OptiMulti and Gematic are trademarks of ITW Gema AG.

All other product names are trademarks or registered trademarks of their respective holders.

Reference is made in this manual to different trademarks or registered trademarks. Such references do not mean that the manufacturers concerned approve of or are bound in any form by this manual. We have endeavoured to retain the preferred spelling of the trademarks, and registered trademarks of the copyright holders.

To the best of our knowledge and belief, the information contained in this publication was correct and valid on the date of issue. ITW Gema AG makes no representations or warranties with respect to the contents or use of this publication, and reserves the right to revise this publication and make changes to its content without prior notice.

Printed in Switzerland

ITW Gema AG
Mövenstrasse 17
9015 St. Gall
Switzerland

Phone: +41-71-313 83 00
Fax: +41-71-313 83 83
E-mail: info@itwgema.ch